

(19) World Intellectual Property Organization  
International Bureau(43) International Publication Date  
24 October 2002 (24.10.2002)

PCT

(10) International Publication Number  
**WO 02/083282 A1**(51) International Patent Classification<sup>7</sup>: **B01F 13/10, B44D 3/00, A45D 44/00, B01F 15/04, A61K 7/13**(GB). **LIVINGSTON, Philip, Robert [GB/GB]**; Flat 4, 81 St. Quintin Avenue, London W10 6PB (GB). **RUSZKOWSKI, Stephen, Waclaw [GB/GB]**; 35 Sutherland Chase, Ascot, Berkshire SL5 8TE (GB). **ZENEZINI, Stefano [IT/BE]**; Avenue de Courses, 7, B-1050 Brussels (BE).(21) International Application Number: **PCT/US02/10424**(74) Common Representative: **THE PROCTER & GAMBLE COMPANY**; Mr. T. David Reed, 5299 Spring Grove Avenue, Cincinnati, OH 45217 (US).

(22) International Filing Date: 3 April 2002 (03.04.2002)

(81) Designated States (*national*): AE, AG, AL, AM, AT (utility model), AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ (utility model), CZ, DE (utility model), DE, DK (utility model), DK, DM, DZ, EC, EE (utility model), EE, ES, FI (utility model), FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD,

(25) Filing Language: English

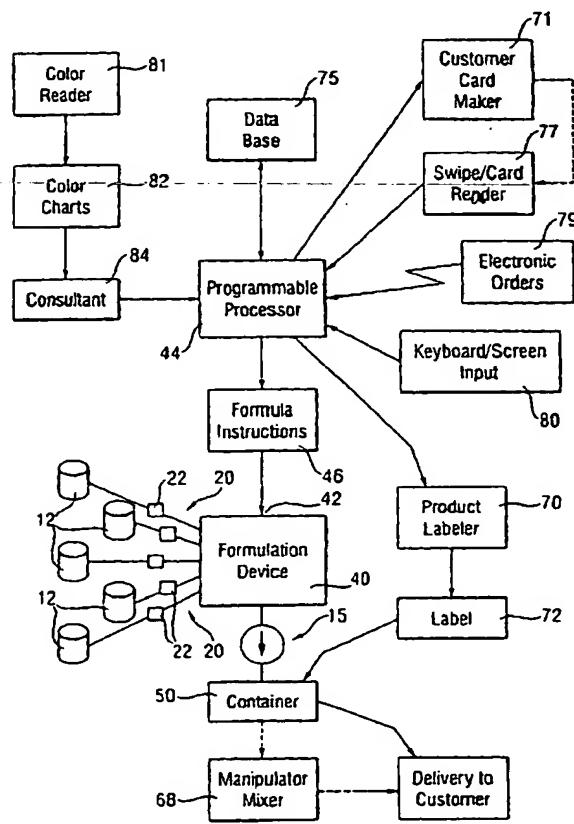
(26) Publication Language: English

(30) Priority Data:  
0108990.3 10 April 2001 (10.04.2001) GB(71) Applicant (*for all designated States except US*): **THE PROCTER & GAMBLE COMPANY [US/US]**; One Procter & Gamble Plaza, Cincinnati, OH 45202 (US).

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(54) Title: CUSTOMIZED HAIR COLORANT FORMULATING AND DISPENSING APPARATUS AND METHOD



(57) **Abstract:** An apparatus and method for formulating and dispensing customized hair colorant products from a plurality of available constituent materials in an oxygen-protected manner. The apparatus includes a plurality of oxygen-protected constituent material sources, at least one oxygen-protected delivery outlet with a delivery coupling for selective attachment with an oxygen-protected container, a dosing mechanism providing fluid communication between each constituent material source and the delivery outlet, and a programmable formulation device for activating the dosing mechanism to selectively dispense appropriate volumes of one or more of the constituents into the oxygen-protected container in an oxygen-protected manner. The invention provides customized hair colorant product in a protected manner, thereby enabling the product to be utilized at a point of purchase or at any time at a remote location, or to be ordered from a remote location and/or shipped to a remote location, without degradation of the product or performance.

WO 02/083282 A1



SE, SG, SI, SK (utility model), SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZM, ZW.

**Published:**

— with international search report

(84) **Designated States (regional):** ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

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## CUSTOMIZED HAIR COLORANT FORMULATING AND DISPENSING APPARATUS AND METHOD

### TECHNICAL FIELD

This invention relates to an apparatus and method for custom formulation and dispensing of hair colorant products in an oxygen-protected manner, and more particularly, to an improved system for formulating and automatically dispensing customized hair colorant products for a consumer at the point of sale or at a remote location, and for facilitating reordering of the customized product for delivery of oxygen-protected products on demand.

### BACKGROUND OF THE INVENTION

Individuals often wish to alter and improve their physical appearance by using hair coloring agents. Conventionally, hair colorant treatment of human hair is generally undertaken in a consumer's home or by a professional at a hair salon. Due to the peculiar nature of this process, including the unique qualities and features of individual consumers hair color, condition, starting color and desired final hair color, as well as the sometimes complex nature of the chemicals and dyes required for hair color treatment and the sensitivity of many dye materials to degradation by oxygen, consumers have been relegated to a choice of obtaining hair colorant services from a professional at a salon, or using a pre-packaged hair colorant product from a limited off-the-shelf selection of products.

While the professional salon service tends to offer both a wider variety of hair colorant availability and customization potential as a result of the professional experience and access of salon professionals to a wide variety of products, such option tends to be many times the cost of the off-the-shelf products and subject to the busy schedules of the participants. On the other hand, while off-the-self products offer convenience for use at home and lower costs, they are generally limited to predetermined varieties of shades and display space or inventory limitations, and the end result of any particular treatment can be unreliable based upon additional variables such as proper color selection, proper use of

products, starting hair conditions, starting hair color, and the like. Moreover, in-home use of off-the-self products cannot provide a consumer the confidence he or she would like in obtaining a final color, and generally do not relate to particular dosage required for a particular application, the level of conditioning needed, and other hair condition and processing variables which can greatly influence the achieved results. Even if the manufacturer of off-the-shelf products provided a vast selection of hair colorant products in terms of shade, dosage and level of conditioning, it is unlikely that any particular retail outlet could or would maintain the full variety of products in their inventories, nor would consumers necessarily have access to expertise in determining the proper product variety for their needs.

Additionally, while a variety of color mixing systems have been known and available for the manufacture of hair colorant products and other color systems (such as paints and stains), hair colorant customizing devices have generally not be utilized except at professional salon establishments for various reasons, including capital costs of the equipment itself, storage and handling problems with respect to the various chemicals, additives and dyes required for hair colorant formulations, and the oxygen sensitivity of hair dye mixes, which tend to degrade upon exposure to oxygen.

For example, methods and systems for customizing cosmetic products can be seen in references such as U.S. Patents 5,622,692 and 5,785,960, which issued to Richard T. Rigg et al. in 1997 and 1998, respectively. In these patent disclosures, a skin analyzer is provided to read skin properties, and a programmable device analyzes the data to provide an optimal formula from a preprogrammed set of formulas. Thereafter, a formulation machine doses and blends the formula into a common dosing chamber for mixing and use by the consumer. It is contemplated that a trial sample of the mixture can be provided to the customer for preliminary review, and that the customer can then manually enter changes desired, such as with respect to the shade of the cosmetic product. The computer can then store the information for that particular customer, and the formulation information can be included on the product container, such as in the form of a bar code, to allow refill of the product at any store which includes the same formulation device. The '960 patent allows for remote customization of dermatological foundation products, whereby a user obtains color data from

a hand-held spectrophotometer or colorimeter. That data is transferred by telemodem to a central monitoring site where a device translates the signal into a formula which mixes the product and ships it to the customer. These devices and methods, however, do not pertain to products which are sensitive to oxygen exposure, and are more akin to the paint tinting devices which have been available for customizing liquid paints for years. Moreover, a consumer utilizing the Rigg et al. cosmetic products must return to a retail store with the labeled product container for refill (in the '692 patent), or have access to a hand-held color reader and/or bar code reader device for ordering products via telemodem for delivery (in the '690 patent). Such arrangements would not be particularly well suited for hair colorant products to be dispensed in an oxygen-protected manner.

U.S. Patent 5,163,010, which issued to Gustave Klein et al., also describes a formulating device for cosmetic products which similarly dispenses raw materials in accordance with a formula into a receptacle for mixture. These cosmetic products can include hair care products, but, again, this system would be appropriate only for immediate use of the hair care product (e.g., such as in a professional salon environment) as it does not account for the oxygen sensitivity of hair colorant dyes and the like.

Likewise, U.S. Patent 5,862,947, which issued to Thomas Wiegner et al., describes a hair dye color selection system which specifically discusses the oxidative dyes and hair colorant mixtures which are particularly sensitive to degradation by exposure to oxygen. This patent explains the traditional use of inert gas to isolate the oxygen-sensitive dyes, and incorporates oxygen-free handling of concentrated dyes provided in collapsible pouches. This patent also contemplates the use of a computer simulation of potential colors for a customer, whereby potential formulations can be simulated until the customer and hair colorist or color consultant are satisfied. A printout of the resulting formula is then made by the computer based upon the selected final hair color and the customer's starting hair color. The formula is then delivered into a mixing cup placed beneath the orifice of the device, whereupon individual raw material components are pumped in sequence or simultaneously for collection and mixing. Again, however, while this patent recognizes the oxygen sensitivity of the constituents of hair dyes, the resulting product must be utilized relatively immediately after mixture in the dispensing cup. A point of sale device similar to this has

recently been disclosed by Fluid Management Europe b.v. (a Unit of IDEK Corporation, The Netherlands).

As a result, heretofore there has not been available a system or method for providing customized hair colorant products in a manner which dispenses and preserves the resulting product in an oxygen-protected manner for delivery to a customer for use as desired, or for shipping to a remote customer for later use. There has been needed an improved system and method which could provide customized products based upon individual customer needs and desires, without requiring point of purchase or immediate use such as in a hair salon setting. It has also been desirable to enable customers to take advantage of improved communications and electronic business formats for obtaining customized products from remote locations to allow for convenient home delivery, customer pick up or other electronic shopping arrangements of oxygen-protected customized products. A system and method taking advantage of the most desirable aspects of traditional salon service hair coloring expertise and customization, as well as providing cost savings and convenience of products for home coloring treatment applications, would also be desirable in the industry. Coupling such an improved system with the ability to reorder customized products from remote locations and via a variety of modern communication modes would further enhance the desirability of such a development.

### **SUMMARY OF THE INVENTION**

Accordingly, it is object of the present invention to address and obviate problems and shortcoming of conventional devices and methods for formulating and delivering hair colorant products.

In one aspect of the present invention, an apparatus for formulating and dispensing customized hair colorant products from a plurality of available constituents in an oxygen-protected manner is provided. The apparatus includes a plurality of oxygen-protected constituent material sources, at least one oxygen-protected delivery outlet with a delivery coupling for selective attachment with an oxygen-protected container, a dosing mechanism providing fluid communication between each constituent material source and the delivery outlet, and a programmable formulation device having an input port for receiving formula

input, and instructions for activating the dosing mechanism to selectively dispense appropriate volumes of one or more of the constituents at the delivery outlet in an oxygen-protected manner. In another aspect of the present invention, an oxygen-protected container includes a sealable inlet for selective connection at the delivery outlet. In one embodiment, the sealable inlet can include a container coupling adapted for sealing attachment with the delivery coupling.

In another embodiment of the present invention, the oxygen-protected container can include a flexible structure which can be manually manipulated from its exterior to allow for mixing operations of its contents prior to use.

In another aspect of the present invention, the apparatus can include an oxygen-protected delivery outlet for each constituent material source. As an alternative, there can be provided a common oxygen-protected outlet for a plurality of constituent material sources.

In yet another aspect of the present invention, a customer and formula database is provided. The programmable formulation device can be connected to the database for selective access and matching of customer formula input in stored customer and formula data.

Another aspect of the present invention includes the provision of a product identifier device with the apparatus. In one embodiment, that product identifier device can include a product labeler, while in other embodiments the product identifier device can include a personalized customer card maker device.

In yet other aspects of the present invention, the apparatus can include a product identifier reader, such as a card reader, bar code reader or other data receiving device. Similarly, the apparatus can include a customer data collection device, which in some embodiments can include a keyboard or touch screen.

Additional aspects of the invention include the option of providing a container manipulating device for ensuring proper mixing of constituents after dispensing. Additionally, where the apparatus includes a plurality of delivery outlets, a container filling mechanism can be provided to selectively align a container with a delivery outlet for a coupled connection therewith.

In another aspect of the present invention, a method for providing oxygen-protected individual use containers of customized hair colorant products is provided. This method includes providing an oxygen-protected formulating apparatus as described above, providing an oxygen-protected product container, and attaching the product container to the delivery coupling of the apparatus. Formula input is provided to the programmable formulation device, and dosing of at least one of the constituent materials to the delivery outlet and into the product container in an oxygen-protected manner provides the improved customized product. In many instances, a plurality of individual constituent materials are delivered into the product container to create the customized hair colorant product.

Additional aspects of the inventive method include the further step of delivering the customized hair colorant product container to a customer. Such delivery step can be provided in the form of shipping the product container to a customer, providing the product to a customer at the point of sale, positioning the customized product at an appropriate pickup location for the customer, or providing the product for the customer to an intermediate recipient.

Yet another aspect of the present invention includes the additional step of receiving a product order in an electronic form. That electronic product order can be received in various manners, such as by the Internet, wireless communication, digital transmission, via voice, or through a product identifier reader. The method of the present invention can also include providing a customer-specific product identifier, which, as mentioned above, can include a label for the product container or a personalized product identifier card.

As also mentioned above, another aspect of the present invention allows for the provision of a customer and formula database with respect to which formula input can be stored, updated and retrieved as needed. Another aspect of the inventive method includes the optional step of recording transaction data from each customer interaction as well as product formulation in the database.

Other aspects and objects of the present invention will become apparent by a careful reading of the present application, specification, drawing figures and claims, and/or as will be understood by those of ordinary skill in the art from the disclosure hereof.

## BRIEF DESCRIPTION OF THE DRAWINGS

While the specification concludes with claims particularly pointing out and distinctly claiming the present invention, it is believed the same will be better understood from the following description taken in conjunction with the accompanying drawings in which:

Fig. 1 is a schematic illustration of exemplary apparatus and method steps of the present invention;

Fig. 2 is a partial diagrammatic cross-section of an exemplary embodiment of a delivery outlet and dosing assembly of an apparatus made in accordance with the present invention;

Fig. 3 is a diagrammatic illustration similar to that shown in Fig. 2, illustrating preliminary priming and pre-dosing of a constituent material;

Fig. 4 is a diagrammatic illustration similar to that shown in Fig. 3, wherein a container has been attached and dosing operations have commenced;

Fig. 5 is a diagrammatic illustration similar to that seen in Fig. 4, illustrating the arrangement following completion of a dosing operation; and

Fig. 6 is a partially schematic perspective view of an exemplary carousel dosing arrangement for automatic formulation of customized products in accordance with present invention.

## DETAILED DESCRIPTION OF EXEMPLARY EMBODIMENTS

Turning now to the drawing figures in detail, wherein like numerals indicate like elements throughout the views, Fig. 1 illustrates a schematic, simplified view of an embodiment of the apparatus and general process of the present invention for formulating and dispensing customized hair colorant products. An apparatus or system 10 for formulating and dispensing customized hair colorant products is shown in this simplified schematic as including a plurality of oxygen-protected constituent material sources 12, which can each be provided in the form of a flexible pouch such as shown at 65 of Fig. 2 (for example), which themselves may comprise laminated layers of material such as plastic and aluminum materials to obviate the migration of oxygen thereinto. As will be understood, many of the raw materials which may be provided individually or mixed (e.g., with other materials to

form an "intermediate") as constituent materials for the present formulating apparatus and method, will degrade if prematurely exposed to oxygen. If such a flexible constituent pouch 65 is utilized for providing the oxygen-protected constituent material sources 12, it may also be desirable to provide a more rigid plastic container to receive such pouch to ease the handling and/or connection and disconnection with respect to the formulation device. As will be discussed in further detail below, such a rigid support might also be provided in the form of a more skeletal support, such as shown as pouch support rack 187 in Fig. 6.

As part of the formulation device, an oxygen-protected delivery outlet as generally shown at 15 is also provided with a delivery coupling 19, which can itself comprise any convenient mechanism for allowing air-tight selective connections of the delivery outlet 15 with an oxygen-protected product container 50 (as seen in Figs. 3-5) and as will be explained in further detail below. A dosing mechanism or assembly 20 is also provided and can include various piping (e.g., 21) to provide oxygen-protected fluid communication, dosing chambers and the like between a constituent material source 12 and the delivery outlet 15. While it may be desirable to provide an individual oxygen-protected delivery outlet for each constituent material source, it is also conceivable that a single delivery outlet could include separated but oxygen-protected delivery outlets for a number of oxygen-protected constituent material sources for selective dispensing in an oxygen-protected manner. Such a single, multiple delivery outlet or delivery "station" would likely require an appropriate design to allow for both air-tight connection to a product container for dispensing procedures, while maintaining separation and obviating any cross contamination among the respective delivery outlets of each of the individual constituent material sources. For simplicity, the examples shown in the drawings will be directed to embodiments wherein each constituent material source has its own individual delivery outlet, but it should be kept in mind that numerous such delivery outlets could be combined at a single delivery station for simultaneous oxygen-protected attachment or connection to an oxygen-protected product container for dispensing operations.

Fig. 1 also shows a product maker or formulation device 40 which is connected to (and as discussed below may include) a programmable processor 44 for receiving formula instructions via a formula input port 42. The programmable processor 44 is contemplated as

including instructions for translating formula input into formula instructions for appropriately activating the dosing mechanism to selectively dispense appropriate volumes of one or more constituent materials from individual material sources 12 at the delivery outlet (e.g., 15) in an oxygen-protected manner. As will be explained, it may be preferred to individually and successively connect a product container 50 to the delivery outlet 15 of each constituent material required for a particular hair coloring formulation. Programmable processor 44 can be a physical part of formulation device 40, or it could be in selective communication therewith from a remote location, as desired. It is contemplated that the processor 44 would include a preprogrammed set of formulas for hair colorant products, such that upon input of customer information and hair color preferences, such as from a color reader 81 and/or color charts 82, as well as selection and input of an appropriate formula to meet those color preferences and requirements by an expert consultant (e.g., 84), the programmable processor 44 would translate the formula into a set of automatic instructions or actions to be implemented by the formulation device 40 through an appropriate machine controller. Such preprogrammed formulas might include recipes for the approximately 70 color variations reasonably discernible to customers, plus variations of those formulas to accommodate different dosages and conditioning levels.

For example, the apparatus or system 10 for formulating and dispensing customized hair colorant products might be located in a store or at a kiosk visited by the customer. The customer might have his or her hair color tested or "read" by any of a number of color reader devices commonly available on the market, such as from Minolta, ColorTech, Data Color, Xrite or others. As understood in the industry, it is important to determine the customer's contributing pigment in order to best achieve the final color desired. The customer would also select a desired final hair color from various color charts and color profiles 82 based upon their starting hair color, their color preferences, length of hair, whether demi- or semi-permanent application is desired, and input from an expert consultant (e.g., 84). The consultant can then make any final determinations of the most appropriate color formula for the particular customer, including customized levels of conditioner and dosage (volume of product). The formula data or input can then be provided to the processor 44, such as by

entry by the consultant electronically, through a keyboard or touch screen (e.g., 80), or other input arrangement.

Once this formula input is provided to processor 44, formula instructions 46 can then be generated and passed on to the formulation device 40 through formula input port 42. It is contemplated that the inventive system 10 can also include a central database 75 which could store customized information with respect to the particular customer, hair peculiarities and preferences, as well as the selected color formula customized for that particular customer. As seen in Fig. 1, it is also contemplated that the present apparatus 10 could also create a customer card such as a credit card having a magnetic strip or chip to store identification information, such as with an attached card maker device 71. In this way, a customer could utilize their personalized card at any corresponding store or kiosk to reorder products simply by providing the credit card for "swiping" through a card reader or similar device 77, whereby customer information and the customized formula information can be quickly identified and/or retrieved from database 75.

Similarly, it is contemplated that the customer could also reorder the product via electronic orders such as through the Internet, by telephone, telemodem, digital transmission, or wireless connection or the like (generally shown at element 79). Such electronic orders could be directed to the processor, whereby order information could be provided directly from the electronic order or the customer's card, or retrieved from the database 75 as needed. Thereafter, the processor 44 would send formula instructions 46 to the formulation device as discussed.

As mentioned, a formulation device of the present invention could include a processor (e.g., 44) integral with or closely associated with the actual product making apparatus 40, or the processor might be separate from, and even remotely located from, the product making apparatus. For example, processor 44 might serve a number of formulation devices 40, whereby orders including formula input are directed to the processor 44, and formulation instructions (which might include delivery information) can thereafter be communicated to an appropriate formulation device 40 for efficient product formulation and delivery. During the ordering process, it is further contemplated that the customer could also input additional information and/or further customize the formulation, such as by changing the conditioning

level or modifying the starting color or final color information to obtain different results. Such input could be provided by a customer data collection device as generally shown at element 80 in Fig. 1, such as a keyboard, a user interface such as at a web site, a touch screen or other data input device. During such customer interaction, programmable processor 44 could also be provided with instructions for eliciting additional information from the customer, such as satisfaction with prior orders, preferences and/or suggestions.

Once the formulation device 40 receives formula instructions 46, appropriate activation of one or more dosing mechanisms 20 in accordance with such instructions selectively dispenses appropriate volumes of one or more of the constituent materials from their sources 12 into an oxygen-protected container (e.g., 50, as seen in Fig. 4) sealingly attached to delivery outlet 15. As generally indicated in Fig. 1, it is further contemplated that the apparatus 10 could include a product labeling device (e.g., 70) for providing an appropriate label 72 to the product container for easy identification of the customized product, as well as to add any particular instructions, customized identification information, reorder information, or other pertinent indicia. For example, label 72 might include bar code information which could be read directly by a bar code reader (which could be utilized as a customer data collection device 80 for facilitating reorder by the customer). Product labeler 70 might be a device which directly prints information onto the container such as by an ink jet printing process, laser printing, or other contact or non-contact style device for providing indicia and information to the container.

Once all of the constituent materials required for a particular customized hair colorant product are dispensed into the oxygen-protected container 50, the container can be removed or detached from apparatus 10 for delivery to the customer. Such delivery can be in the form of simply handing the sealed container to the customer, or by delivery through any known means such as postal delivery. It is also contemplated that apparatus 10 might optionally include a container manipulator or mixer device 68 for ensuring that the dispensed constituent materials within container 50 are adequately and homogeneously mixed. For many hair colorant formulas, manual manipulation of container 50 by the consultant prior to delivery to the customer, and/or by the customer prior to use, should be completely adequate for proper mixing. However, with some products, particular constituent materials may be of

higher viscosity, and there may be instances where physical manipulation of the container, such as by off-set rollers or other mechanical kneading devices or the like might be desirable as part of apparatus 10. These devices could be provided in any manner so as to provide physical manipulation of the at least partially filled container 50 following dispensing of the constituent materials by the formulation device 40.

Turning now to drawings Figs. 2-5 in more detail, an exemplary embodiment of a dosing mechanism or assembly 20 and its delivery coupling 19 is shown to illustrate the required fluid communication between an oxygen-protected constituent material source 12 and an oxygen-protected container 50 for air-tight dispensing procedures in accordance with the present invention. For example, Fig. 2 shows the lower portions of an exemplary constituent material source 12 which might be provided in the form of an at least partially flexible pouch 65 having a female outlet coupler 13 provided adjacent its lower edge. As will be appreciated, it is contemplated that the system would be designed such that female outlet coupler 13 would have a size and shape generally corresponding to a male delivery inlet coupler 30 of delivery coupling 19. Coupler 13 is also shown as including a peripheral flange or snap ring 14 for receiving the male delivery inlet coupler 30 and assisting in providing a firm and air-tight connection therewith. Delivery coupling 19 is shown as including a similar alignment flange or snap ring 31 for selective locking and sealing engagement with the corresponding flange 14.

While any number of structural arrangements could be utilized for providing the air-tight seal between delivery coupling 19 and the constituent material source 12, a coupling system such as available from IPN Company and sold under the name "Clean- Clic" may be particularly adaptable. Such a connector, however, may have to be modified such as shown as in the drawing figures to include additional components in accordance with the present invention.

Fig. 2 shows delivery coupling 19 prior to its insertion into and connection with female outlet coupler 13 of the pouch 65. Coupling 19 includes a lower portion having a male delivery outlet coupler or container coupling 33, which in turn carries the actual delivery outlet opening 15. A similar flange or snap ring 34 is provided adjacent male delivery outlet coupler 33 as will be discussed. Between flanges 31 and 34, respectively, is

shown a dosing chamber 29 defined by piping 21 and on its upper and lower ends by an upper dosing valve 25 and a lower dosing valve 27. A pressure port or opening 26 is provided adjacent a side wall of dosing chamber 29 and provides fluid communication between dosing chamber 29 and at least a portion of the dosing mechanism 20 which might be defined in part by some of the piping 21 of coupling 19. In this example, a pump device 22 is provided as including a reciprocating piston 23 and an actuator 24, which in this case includes a piston rod. It should be understood that any mechanism which can provide for precise and predetermined dosing of constituent material 16 from an oxygen-protected constituent material source (e.g., 12) to the delivery outlet 15 can be utilized. It is contemplated that a volumetric piston pump 22 might be desirable for this task, in order to provide precise "shots" of constituent material 16 upon activation, with accuracy of approximately  $\pm 0.1$  ml.

As seen best in Fig. 3, once coupling 19 is inserted into female outlet coupler 13 such that the snap rings 14 and 31 help provide a air-tight seal therewith, the distal end of the male delivery inlet coupler 30 and its product receiving port 32 will be aligned with a dispensing valve 17 designed to align with receiving port 32, and will be opened to provide fluid communication with the constituent material 16 upon full insertion of the male delivery inlet coupler 30 as shown. In this way, the constituent material 16 is protected from exposure to oxygen or other contaminates, and a direct and intimate, sealed fluid coupling can be created.

Once this connection is completed, dosing mechanism 20 can be primed such that dosing chamber 29 and a predetermined dosing shot chamber 29a are filled with constituent material 16. Priming should also include filling the lower portions (e.g., 33) of coupling 19 with product (as shown) to insure that no air or oxygen remains in the system.

As will also be understood, prior to dispensing procedures, an oxygen-protected container 50 must be attached in an air-tight, sealed relationship with the male delivery outlet coupler or container coupling 33 (as shown in phantom in Fig. 3). Similar to the connection discussed above with respect to the constituent material pouch 65, container 50 is illustrated with an exemplary female delivery outlet coupler 55, having a product inlet port or valve 57 providing a sealable inlet therewithin. Upon proper and full insertion of the male delivery outlet coupler 33 within the female delivery outlet coupler 55, product inlet port or valve 57 will be aligned with delivery outlet 15 and opened to provide fluid communication therewith.

When formula instructions are provided to the formulation device 40, a particular constituent material 16 required by the formula will be connected by its delivery coupling 19 to container 50 as described, and the dosing mechanism 20 will be activated as seen best in Fig. 4. As piston 23 is moved toward pressure port 26, the predetermined dose shot 29a of constituent material to be dispensed (i.e., 16a) is forced by pressure through lower dosing valve 27, through male delivery outlet coupler 33 and into the oxygen-protected container 50, which might be provided in the form of a flexible bag (e.g., 52) made of a similar laminated material such as plastic with an oxygen barrier layer (e.g., aluminum). As illustrated in Fig. 5, upon completion of the dispensing stroke of piston 23, the predetermined dose shot 29a of constituent material 16 is delivered to the container 50 (as seen at 16a). Upon cessation of the dispensing pressure of piston 23, delivery outlet 15 would be designed to again seal to prevent entry of air into the system. At this time, dosing mechanism 20 is fully primed but not ready for delivery of an additional predetermined dose shot of constituent material. A typical dose shot might be 2-10 ml, for example.

It is contemplated that piston 23 would remain in the primed position shown in Fig. 5 until receiving instructions from the formulation device and/or programmable processor 44 to pre-measure another predetermined shot dose. Dosing mechanism 20 can thereby provide varying volumes of the particular constituent material in accordance with the formula instructions received simply by retracting to the appropriate point to provide the required predetermined dose shot 29a. As indicated, it is contemplated that following a dispensing operation, delivery outlet 15 will automatically close or reseal to minimize the infiltration of oxygen or other air into the system between dispensing operations.

Thereafter, if the appropriate predetermined amount of the particular constituent material has been delivered to container 50, the container can be removed or detached from coupler 19 simply by downward (and/or possibly twisting) relative motion of the container 50 with respect to male delivery outlet coupler 33. Thereafter, container 50 could be sequentially coupled with any number of additional constituent material delivery couplings (e.g., 19) to receive additional shot doses of other constituent materials in accordance with the formula instructions. It is contemplated that alignment of container 50 and connection of its female delivery outlet coupler 55 with respective male delivery outlet couplers 33 of other

individual constituent material sources 12 could be done automatically by the formulation device 40, and that the automation of these processes could be accomplished by a variety of structural arrangements, such as encoders, stepper motors, switches and the like.

One simplified exemplary automatic arrangement for an apparatus 110 of the present invention is shown schematically in Fig. 6 accordingly. Particularly, it is contemplated that a formulation device 140 might include a constituent material carousel 185 might be provided with a plurality of delivery outlet bores 186 spaced around the periphery for receiving at least portions of the delivery coupling 19 of a plurality of oxygen-protected constituent material sources 12 as described above. A number of those individual constituent material sources 12 are shown in Fig. 6 shaped around a portion of the carousel 185, although any number of constituent material sources could be provided by appropriately sizing the formulation device and its carousel 185. Typical constituent material pouches 165 might contain 1.5-2 liters, and the arrangement should include a "low level" indicator (not shown) to allow for appropriate change-out of empty pouches as needed.

In this example, the flexible constituent material pouches 165 are shown as being supported by skeletal-style pouch support racks 187, and wherein the dosing mechanisms 120 extend radially inwardly from the delivery couplings 119. As will be understood, the delivery outlets 115 for each of the couplings 119 might extend downwardly (i.e., depend) from the carousel 185 for selective attachment with a corresponding female delivery outlet coupler of an oxygen-protected container 50. Alternatively, such delivery outlets 115 and at least part of the couplings 119 might be protected within a recess on the lower surface of a rack or carousel 185 for selective attachment with a container. It is contemplated that carousel 185 could be made rotatable by a centrally-located carousel driver 189 such as a stepper motor or the like, appropriately controlled by the formulation device and/or as programmable processor 44.

Also shown in Fig. 6 is an exemplary container filling mechanism 195 located on a lower carousel 196 and illustrated as comprising a container support 197 which might receive a container 50 adjacent its flange or snap ring (e.g., 59) and female delivery outlet coupler. Container support 197 is shown as being mounted on a support platform 198 which could be adjustable relative to the constituent material delivery outlet 115 depending from the

constituent material carousel 185. An elevator arrangement (e.g., 199) might be utilized to provide that relative motion, or reciprocation, such that the container 50 could be selectively snapped into sealed connection with any one of the male delivery outlet couplers 33 of the constituent materials pouches 65. While a base 200 is shown upon which the elevator could rest, it is also contemplated that support platform 198 could be connected directly to a lower carousel 196. As will be understood, it might be desired to provide the lower carousel 196 with a rotating device similar to the carousel driver 189 described above, and it might be more desirable to maintain the constituent material sources stationary in use. In other words, relative movement between a particular container 50 to be filled and the individual constituent sources 165 could be provided in any manner, and it is only relative movement which would be required to allow successive connection of the oxygen-protected container 50 with a plurality of constituent material sources for dispensing of the formula ingredients. While not shown, apparatus 110 could also include a cover or enclosure for at least the moving parts and the flexible constituent material pouches.

As will be appreciated, the apparatus for formulating and dispensing customized hair colorant products and the method of the present invention allows for the customized dosing of a predetermined formula for such hair colorant product in an oxygen-protected manner to an oxygen-protected product container. This container can then be delivered to the customer at the point of sale or shipped to a customer at a remote location. In this way the customer has the ability to transport the protected finished product and/or store the product for later use without compromising the quality and freshness of the product. The invention enables customers to have ready access to a virtually unlimited spectrum of customized hair colorant formulations and products for home use or delayed use in the location and circumstances desired by the customer, and reorder of the customized product can be undertaken electronically from remote locations, or by visiting any point of purchase having an electronic input device (e.g., device 80 of Fig. 1) or the inventive formulation device.

As an example of hair colorant products which can be customized, formulated, dispensed and provided to a customer in accordance with the present invention, a coloring composition product comprising a peroxide cream and a dye cream is generally utilized for hair coloring treatments. A customer-specific customized product of this type might be

provided by the inventive system as follows. The coloring composition product would be mixed just before each application by combining the peroxide cream with the dye cream and then appropriately applying it to the user's hair. The complete product kit would generally include a standard peroxide cream mixture, the details of which are not critical to the present invention and which can be provided in various forms and formulations as known to those skilled in the industry. As such peroxide cream mixtures are generally not sensitive to oxygen or other elements of ambient air, the peroxide cream can be provided in the form of a squeeze tube or similar conventional packaging. The volume of the peroxide cream might be kept constant, or may be varied according to short, medium or long hair applications. Other elements of the product kit might include an applicator or comb device, a mixing container, a sachet having a predetermined amount of conditioner, perfume additives, and the dye cream formulation in its oxygen-protected product container as discussed above. For point of sale delivery of products with the inventive apparatus, pre-packaged kits could be provided with all of the elements included except for the customized dye cream formulation product container. Similarly, remote factory installations or free-standing order fulfilment centers or kiosks implementing the apparatus and method of the present invention might also include a stock of pre-packaged kits having various pre-determined options with respect to conditioners, perfumes, volume of product, applicators and the like for ready combination with a customized hair colorant dye cream formulation to be formulated and dispensed and matched with a pre-packaged-kit in accordance with a customer's received order.

In the case of a first-time customer or a customer desiring a hair color treatment quite distinct from any previous customized formulations, it is contemplated that the customer would visit a customizing location for interaction with an expert consultant (e.g., 84). During that visit, the customer's hair color (contributory pigment) would be "read" either by any of the commercially available color analyzing system, or as described in the pending patent application of Suresh Marapane et al. entitled "Method for Analyzing Hair and Predicting Achievable Hair Dying Ending Colors," filed May 12, 2000 under Serial No.09/570,292, the disclosure of which being hereby fully incorporated herein by reference. The customer might also be asked to input additional data such as name, address, billing address and shipping address for future orders, payment information, as well as other customer data such as hair

length, condition, color preferences and the like. Color preferences and ending color choice could also be determined from various color charts (e.g., 82) and in consultation with the expert consultant 84 who would assist in determining the appropriate formula information to be provided to the programmable processor 44 of an apparatus 10 of the present invention.

As mentioned above, it is contemplated that the processor 44 would be preprogrammed with a set of formulas corresponding to constituent material sources 12 provided in conjunction with the formulation device, providing a vast assortment and array of possible combinations to achieve virtually unlimited product customization. For example, the formulation device might be provided with 25 to 32 different constituent material sources, which would likely include typical couplers and precursors for formulating dye premixes, as well as various antioxidants, solvents, water, fatty alcohols, emulsion bases, aqueous ammonium hydroxide, reducing agents and the like. As discussed above with respect to exemplary Fig.6, an automated device made in accordance with the present invention might include formulation device 140 having a plurality of constituent material sources in the form of flexible oxygen-protected pouches 165 supported in proximity for automatic selective alignment with a product container for dispensing procedures.

Once the customer's starting hair color has been analyzed, and that data along with the customer's desired end color and other customer data utilized by the customer and the consultant for determining an appropriate customized formula, that formula input is provided to the programmable formulation device (e.g., programmable processor 44 and formulation device 40 of Fig. 1). The formula input might also include a choice of product volumes (e.g. 60 ml for short/medium, or 100 ml for medium/long hair). As mentioned above, the programmable processor is provided with instructions, such as in the form of algorithms, software, code and the like, for translating the formula input data into a set of actions or control commands (formula instructions) for activating the formulation device for dispensing procedures. Those formula instructions might be provided to a machine controller for implementation of connection of a container 50 to at least one of the constituent material sources, such as by connection with a delivery coupling 19, as discussed in detail above. In most cases, container 50 will be provided with predetermined amounts of constituent materials from a plurality of constituent material sources, such as by the successive

attachment to individual delivery couplings 19 for such constituent material sources. It should also be noted that some or all of the containers 50 might optionally be provided with some standard non-reactive constituents (e.g., emulsion base) already predosed in the container to expedite formulation procedures. Prefilling of standard ingredients might allow for faster formulation cycles, optimal machine automation by avoiding frequent refills of constituent sources, and simplification of the process, among other advantages.

Set forth below are examples of dye cream formulations which could be easily formulated and dosed using an apparatus and method of the present invention, as well as exemplary dye premix constituent materials.

#### EXEMPLARY GENERAL DYE CREAM FORMULAS

For Dark Shades	% by weight
Water	as required up to 50
Emulsion Base	22.5000
Dye premix	14.0000
Decyl glucoside (optional)	0.5000
30% Aqueous Ammonium hydroxide	4:1300

For Reds and Browns	% by weight
Water	as required up to 50
Emulsion Base	22.5000
Dye premix	14.0000
Decyl glucoside (optional)	0.5000
30% Aqueous Ammonium hydroxide	5.1000

<b>For Blondes</b>	<b>% by weight</b>
Water	as required up to 50
Emulsion Base	22.5000
Dye premix	14.0000
Decyl glucoside (optional)	0.5000
30% Aqueous Ammonium hydroxide	6.0000

**EXEMPLARY DYE EMULSION BASE FORMULA**

	<b>% by weight</b>
Water	as required
Ceteareth 25	1.5000
Cetyl Alcohol	2.2500
Stearyl Alcohol	2.2500
Sodium Benzoate	0.0557
Phenoxyethanol	0.0668
Benzyl Alcohol	0.0668
Tetrasodium EDTA	0.0223
DC Q2-8220 from Dow Corning (optional)	2.0000

**EXEMPLARY DYE PREMIX CONSTITUENT MATERIALS**

p-Phenylenediamine  
 p-Aminophenol  
 N4, N4-bis Hydroxyethyl-p-PD sulphate  
 o-Aminophenol  
 p-Methylaminophenol  
 2,5, Diamonotoluene Sulphate  
 m-Aminophenol  
 4-amino-2-hydroxytoluene  
 Resorcinol  
 2-methyl resorcinol  
 2-Amino-3-Hydroxypyridine  
 2-Amino-4-Hydroxyethylaminoanisole sulphate  
 2-methyl-5-hydroxyethylaminophenol  
 m-Phenylenediamine sulphate  
 1-phenyle-3-methyl-5-pyrazolone  
 Naphthol  
 Water  
 Reducing Agents such as Sodium Sulphite  
 Anti-oxidants such as D and L-Ascorbic Acid  
 Metal Chelants such as EDTA  
 Solvents such as glycols and alcohols

Several exemplary dye premix formulations for a mid-brown and a black color are similarly shown below.

**EXEMPLARY DYE PREMIX FORMULATIONS**

	MID-BROWN	BLACK
	% by Weight	% by Weight
p-Phenylenediamine	0.7000	0.6000
p-Aminophenol	0.0000	0.0000
N4, N4-bis Hydroxyethyl-p-PD sulphate	0.1500	1.0000
o-Aminophenol	0.0000	0.0000

p-Methylaminophenol	0.0000	0.0000
2,5, Diamonotoluene Sulphate	0.5000	1.0000
m-Aminophenol	0.1200	0.1000
4-amino-2-hydroxytoluene	0.0000	0.0000
Resorcinol	0.0000	0.2000
2-methyl resorcinol	0.6000	0.0000
2-Amino-3-Hydroxypyridine	0.0000	0.0000
2-Amino-4-Hydroxyethylaminoanisole sulphate	0.0000	0.0000
2-methyl-5-hydroxyethylaminophenol	0.075	1.0000
m-Phenylenediamine.sulphate	0.0000	0.1500
1-phenyle-3-methyl-5-pyrazolone	0.2000	0.3000

When each element of the dye cream formula has been dispensed into the container 50, it would generally be desirable to provide an appropriate product label (e.g., 72) to the container 50 for ease of identification and, possibly, for reordering processes in the future. That completed container might then be manipulated or externally mixed such as by a mixer 68, and then combined with the balance of the product kit described above for delivery to the customer. Placement of a label 72 might also be combined with a manipulation/mixing step, such as by a label applying roller system. As also mentioned, during this customization visit, the customer may be provided with a customer card including information that can be utilized for facilitating remote reordering of the customized hair colorant product in the future. As also mentioned, the transactional information from this customer interaction would also desirably be stored in a central database (e.g., 75). The completed kit could then be provided

directly to the consumer at the point of sale (or point of customization), or shipped to a customer at a remote location.

Reordering of a customized product is very simple thereafter, as the customer can utilize their personalized customer card, the product number from the container label 72, and/or the electronic ordering instructions provided to the customer. As the label 72 can include either a product number, product code designation, and/or bar code, it is contemplated that the customer could use a telemodem or other communication connection to an apparatus 10 to simply electronically order further products, or could utilize their customer card in a card reader or by typing in a customer identification number or other information electronically, by telephone, wireless connection, digital transmissions, Internet connection, or other method of communication. That order would be received and directed to a processor 44, which could then contact the database 75 to obtain the needed information for filling the order, shipping and billing the customer.

It is also contemplated that ongoing contact or interactions with customers could provide valuable customer input, marketing information, demographic information and other customer data to the system 10, for storage in database 75 and/or use for product upgrades or marketing of related products which might be useful to that particular customer. As such, the present invention can provide a useful interactive system, wherein customers can obtain highly customized products very efficiently and conveniently, and the system can also be utilized as or with an interactive tool to obtain valuable marketing information from a customer base and/or allow the customer to be directed to additional products and services of interest.

Additionally, it should be understood that by providing a highly customizable product for an individual customer in a very convenient way, required inventory and stock of various pre-formulated hair colorant products can be avoided while providing consumers with professional customization without the negatives of cost and convenience previously required to obtain conventional hair colorant customization in a beauty salon. Having shown and described the principles of the invention in the various exemplary embodiments, it should be apparent to those skilled in the art that the invention can be modified in arrangement and detail without departing from these principles. Many of such modifications and alternatives

have been discussed or suggested herein, and may others will become apparent to those of ordinary skill in the art in accordance with such principles. Accordingly, the scope of the present invention is not limited to the examples shown and described herein, and all such modifications are intended to be included in the appended claims as follows.

**WHAT IS CLAIMED IS:**

1. An apparatus for formulating and dispensing customized hair colorant products from a plurality of available constituents in an oxygen-protected manner, comprising:
  - a plurality of oxygen-protected constituent material sources;
  - an oxygen-protected delivery outlet comprising a delivery coupling for selective attachment with an oxygen-protected product container;
  - at least one dosing mechanism further comprising piping providing fluid communication between each constituent material source and said delivery outlet; and
  - a programmable formulation device having an input port for receiving formula instructions for activating the at least one dosing mechanism to selectively dispense appropriate volumes of one or more constituents from said constituent material sources at said delivery outlet in an oxygen-protected manner.
2. The apparatus of claim 1, further comprising an oxygen-protected container having a sealable inlet for selective connection at said delivery outlet.
3. -- The apparatus of claim 2, wherein said sealable inlet comprises a container coupling adapted for sealing attachment with said delivery coupling.
4. The apparatus of claim 2, wherein said container comprises a flexible structure which can be manually manipulated from the exterior.
5. The apparatus of claim 1, further comprising an oxygen-protected delivery outlet for each constituent material source.
6. The apparatus of claim 1, further comprising a customer and formula data base.

7. The apparatus of claim 6, wherein said programmable formulation device is connected to said data base for selective access and matching of customer formula input and stored customer and formula data.
8. The apparatus of claim 1, further comprising a customer specific product identifier device.
9. The apparatus of claim 8, wherein said product identifier device comprises a product labeler.
10. The apparatus of claim 8, wherein said product identifier device comprises a personalized customer card maker.
11. The apparatus of claim 1, further comprising a product identifier reader.
12. The apparatus of claim 1, further comprising a customer data collection device.
13. The apparatus of claim 12, wherein said data collection device comprises a keyboard or touch screen.
14. The apparatus of claim 12, wherein said data collection device is arranged for communication with a hair color reader.
15. The apparatus of claim 1, further comprising a container manipulating device.
16. The apparatus of claim 2, further comprising a container filling mechanism adapted to selectively align a container with a delivery outlet for coupled connection therewith.
17. A method for providing oxygen-protected individual use containers of customized hair colorant products comprising the following steps:

- providing an oxygen-protected formulating apparatus having a plurality of separate oxygen-protected constituent material sources, at least one oxygen-protected delivery outlet with a delivery coupling, a dosing mechanism providing fluid communication between each constituent material source and said delivery outlet, and a programmable formulation device and formula instructions for activating the dosing mechanism according to formula input;
- providing an oxygen-protected product container;
- attaching the product container to the delivery coupling;
- providing formula input to said programmable formulation device; and
- dosing at least one of said constituent materials to said delivery outlet and into said product container in an oxygen-protected manner.

18. The method of claim 17, wherein said programmable formulation device translates said formula input into dosing instructions.

19. The method of claim 17, further comprising the step of delivering the customized hair colorant product container to a customer.

20. The method of claim 19, wherein said delivering step comprises shipping the product container to a customer.

21. The method of claim 17, further comprising the step of receiving a product order in an electronic form.

22. The method of claim 21, wherein said electronic form product order is received via the Internet, wireless communication, voice, or through a product identifier reader.

23. The method of claim 17, further comprising the step of providing a customer specific product identifier.

24. The method of claim 23, wherein said customer specific product identifier comprises a label for the product container or a personalized product identifier card.
25. The method of claim 24, wherein said personalized product identifier card comprises machine readable product formula input.
26. The method of claim 17, further comprising the step of providing an expert consultant to assist in specifying formula input for a customized hair colorant product.
27. The method of claim 17, further comprising the step of providing a customer and formula data base from which formula input can be retrieved.
28. The method of claim 17, wherein the step of dosing is initiated upon receipt of an order from a customer and guided by customer and formula input from said data base to said programmable formulation device.
29. The method of claim 27, further comprising the step of recording transaction data from each customer interaction and product formulation in said data base.
30. The method of claim 17, further comprising the step of sequentially attaching the container to a plurality of delivery couplings for dosing of individual constituents.
31. A method for providing oxygen-protected individual use containers of customized hair colorant products comprising the following steps:
  - providing an oxygen-protected formulating apparatus having a plurality of separate oxygen-protected constituent material sources, at least one oxygen-protected delivery outlet with a delivery coupling, a dosing mechanism providing fluid communication between each constituent material source and a delivery outlet, and a programmable formulation device having a formula

receiving port and instructions for activating the dosing mechanism according to formula input;

- providing an oxygen-protected product container;
- attaching the product container to the delivery coupling;
- providing formula input to said programmable formulation device;
- dosing a plurality of said constituent materials to said delivery outlet and into said product container in an oxygen-protected manner in accordance with said formula input; and
- removing the product container from the delivery coupling without exposing the dosed contents thereof to oxygen.

32. The method of claim 31, wherein said dosing step comprises a plurality of successive attachments and removals of said oxygen-protected container to individual delivery couplings for particular constituent materials, and dosing of each particular constituent material in an oxygen-protected manner to said container while attached to the delivery coupling of such particular constituent material.

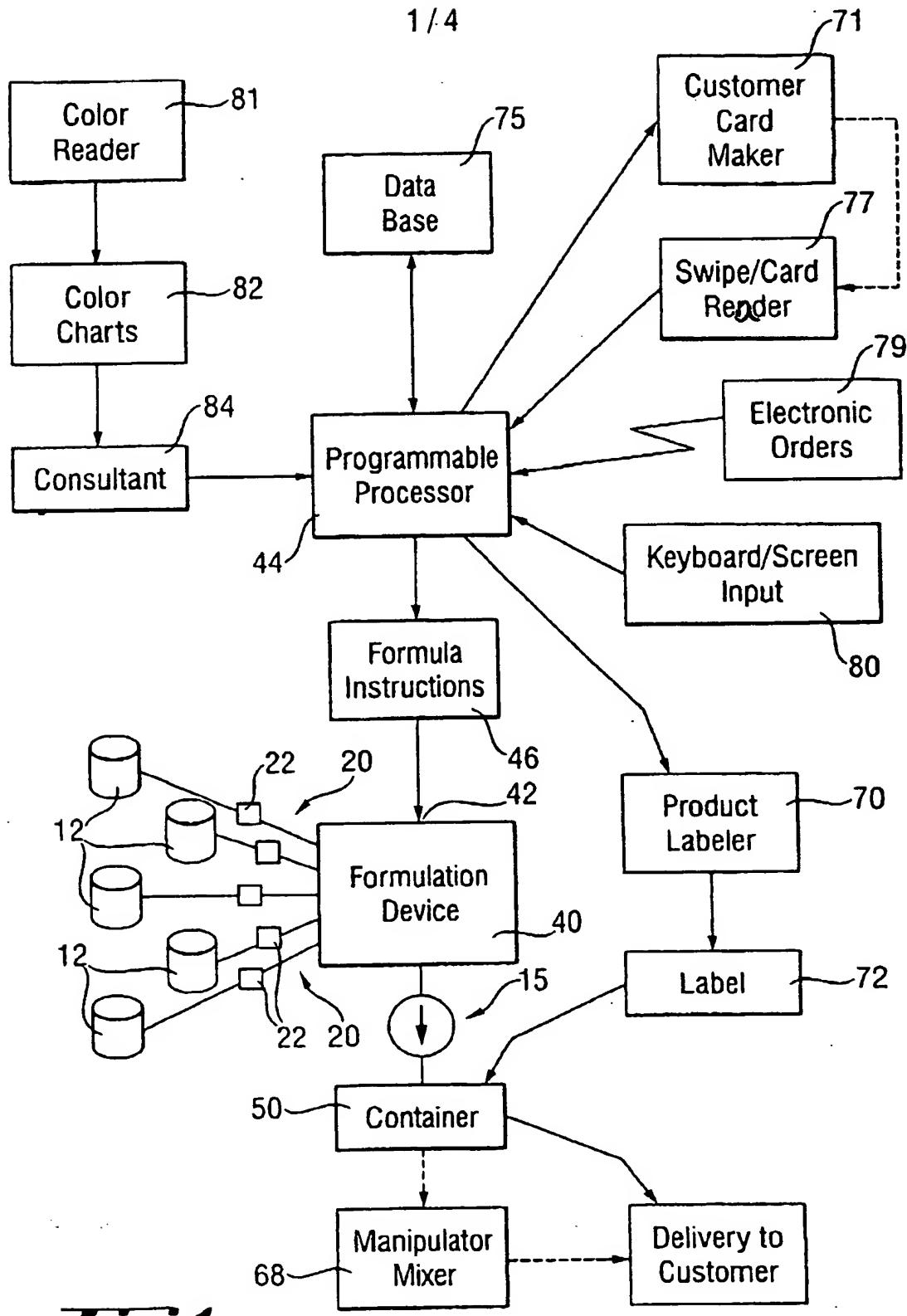
33. The method of claim 31, further comprising the step of providing a customer and formula data base from which formula input can be retrieved.

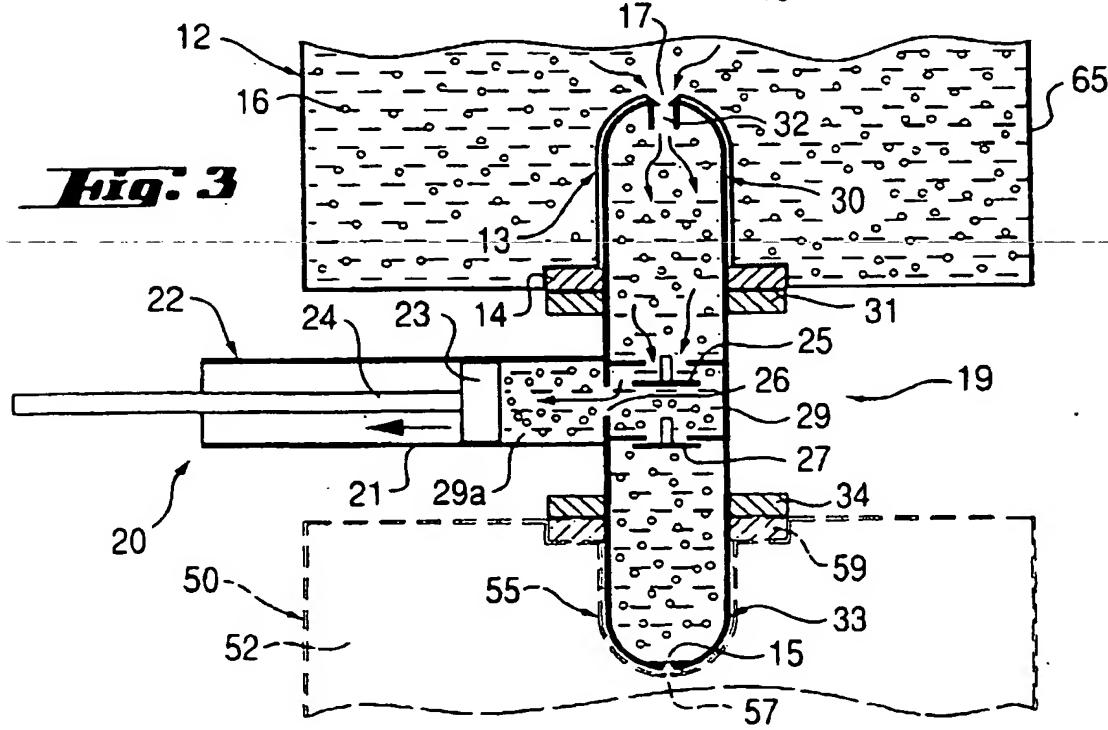
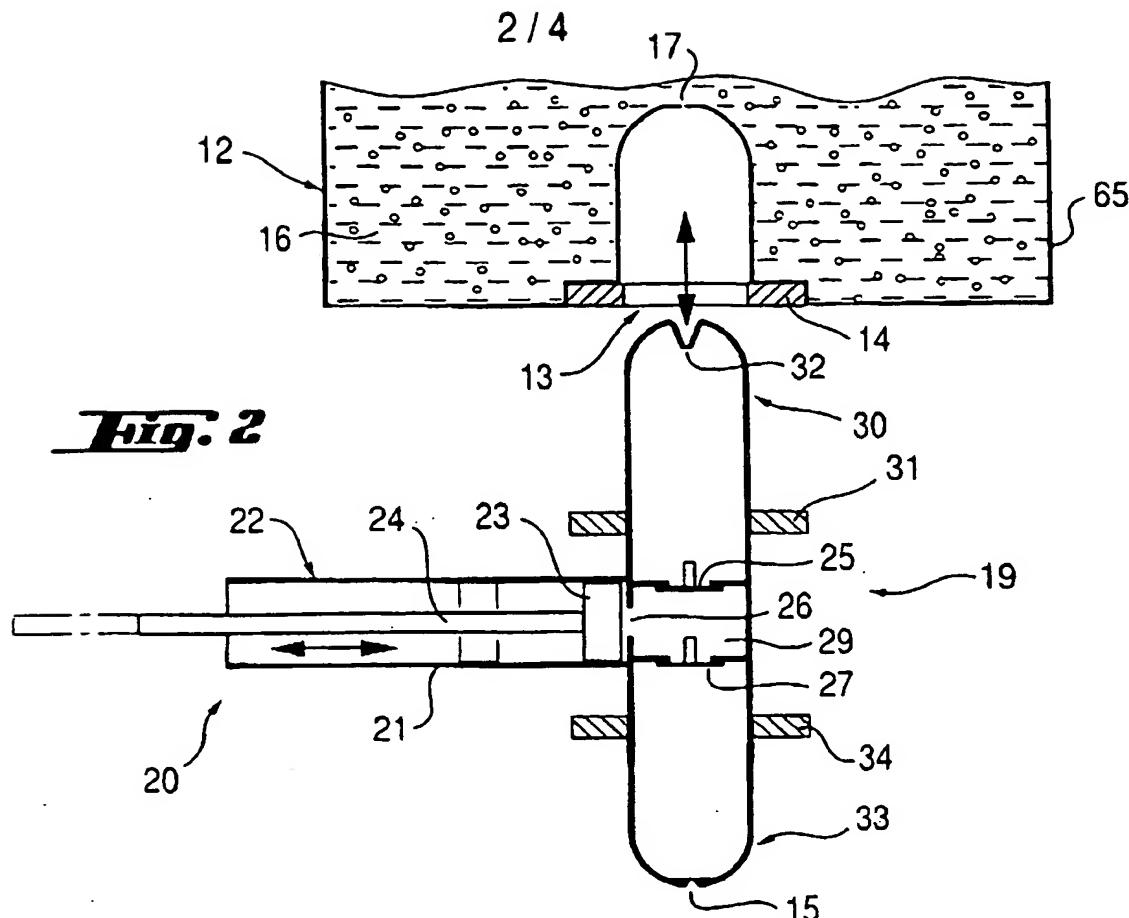
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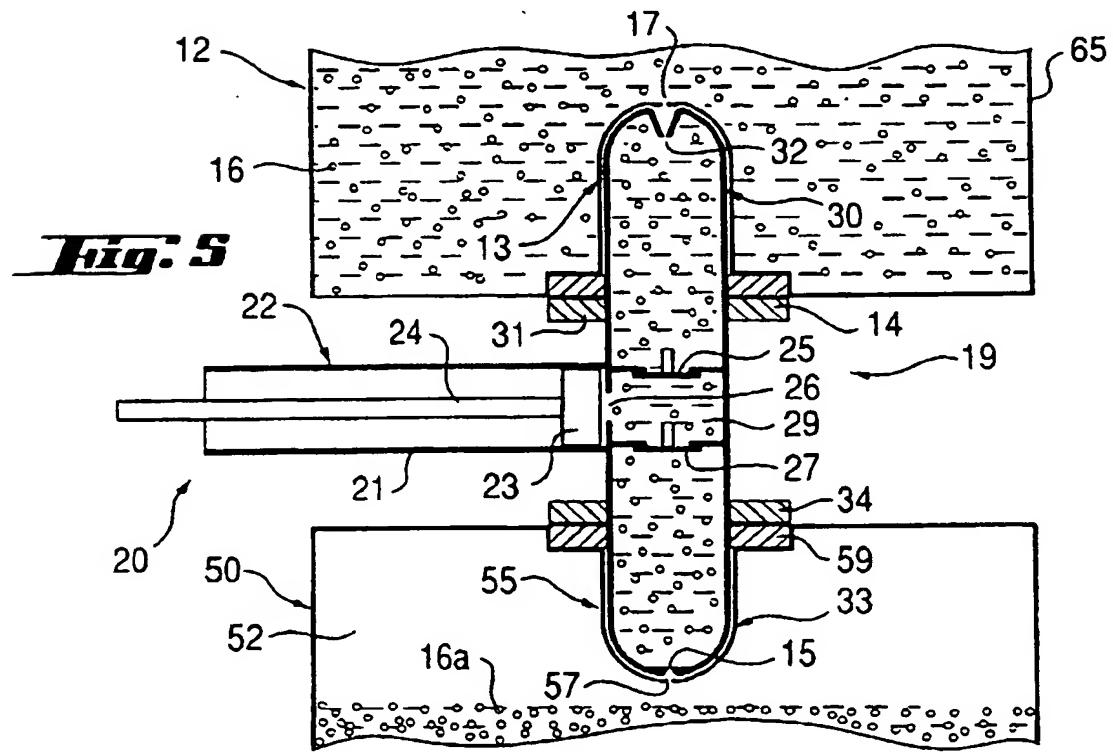
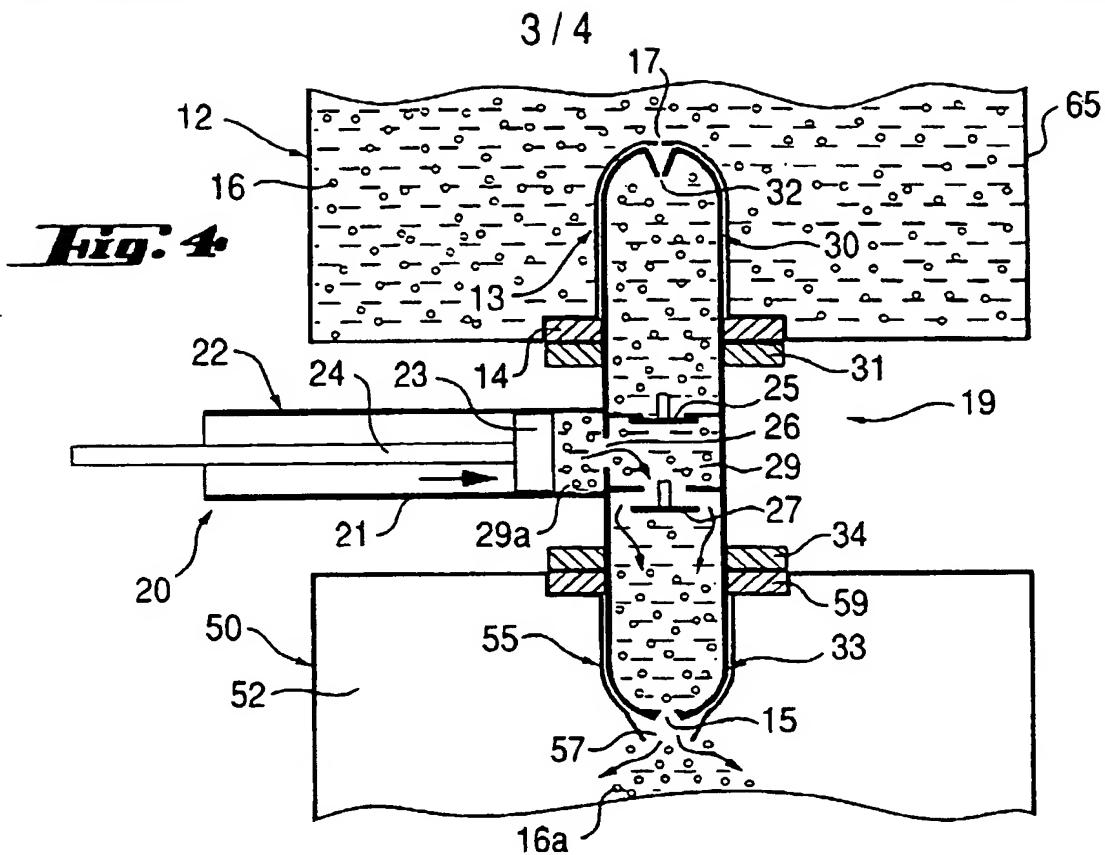
34. The method of claim 33, wherein said formula input is retrieved from said data base in response to receipt of a product order of a customized product.

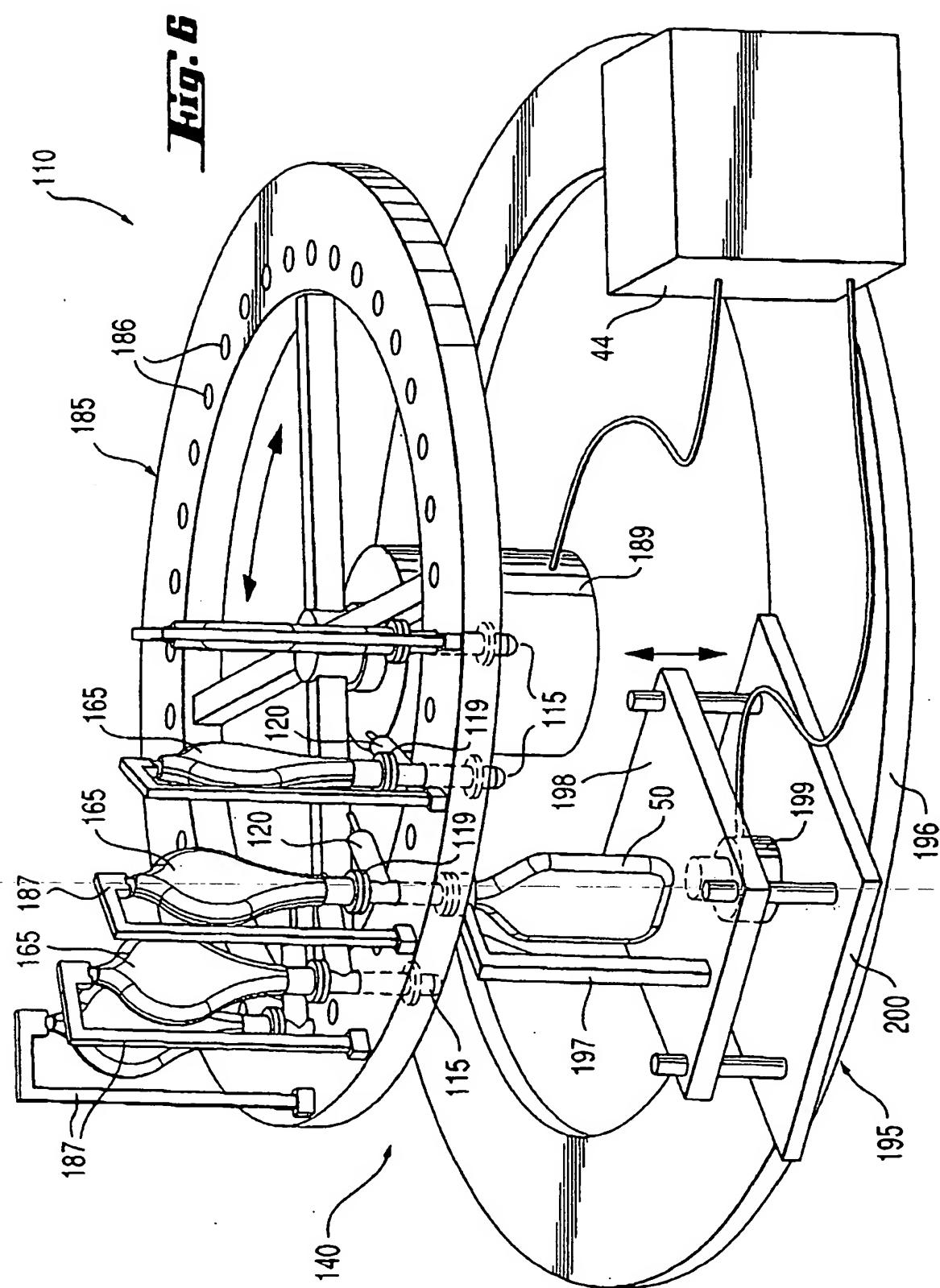
35. The method of claim 34, further comprising the step of receiving a product order in an electronic form.

1 / 4

**Fig. 1**







## INTERNATIONAL SEARCH REPORT

Intl. Application No.  
PCT/US 02/10424

A. CLASSIFICATION OF SUBJECT MATTER  
IPC 7 B01F13/10 B44D3/00 A45D44/00 B01F15/04 A61K7/13

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)  
IPC 7 B01F B44D A45D A61K G01J

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

WPI Data, PAJ, EPO-Internal

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

## \* Special categories of cited documents :

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Date of the actual completion of the international search

23 July 2002

Date of mailing of the international search report

30/07/2002

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## INTERNATIONAL SEARCH REPORT

Int. Application No.

PCT/US 02/10424

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

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